

SPRING 2020

MAS.S65/6.S898 **Democratizing AI through K-12 AI Education for All.**
Units **(2-3-7)**
Meets: **Wednesday, 2-4pm**
Meeting Link: **[REDACTED]**
Instructors: **Cynthia Breazeal & Hal Abelson**
TA: **Randi Wililams**
Permission of Instructor required

Overview

How can we prepare students with knowledge, skills, and attitudes for future careers that increasingly rely on AI technologies?

Inequity of education remains a key barrier to future opportunities and jobs where success depends increasingly on intellect, creativity, and the right skills. While AI is already entering the education system to support students, teachers, or school administration -- it is not currently offered as a topic to be learned until the university level. Just as learning to code has become recognized as a new literacy for the 21st century, students need to also learn about AI given its growing prevalence across industries, institutions, and society on a global scale. Otherwise, we risk leaving far too many people behind in the emerging AI-economy -- causing significant societal stress and divisiveness rather than enabling transformative opportunities where everyone can participate in, benefit from, and influence our future with AI.

This weekly project-based class explores the question of “how do we empower middle-school students to learn about AI in a collaborative, hands-on way?” Students taking this course will work in teams to develop constructionist tools and activities to introduce 6th-8th grade learners to important concepts, practices and design principles of artificial intelligence – i.e., how machines think and learn and how to design them in an ethical way. Homework will involve critiques of existing project-based learning curriculum and design of new curriculum modules. Fieldwork will involve working with middle-school students in afterschool programs to evaluate hands-on projects in an iterative cycle of development and refinement with stakeholder input. An important objective of class projects is to effectively integrate ethical design concepts and practices into proposed activities and curriculum in grade-appropriate ways so that students appreciate these issues in the AI-enabled projects they create.

Example class projects can take the form of developing an AI curriculum module that covers a core AI concept through hands-on projects based on Scratch or App Inventor with integrated services (machine learning, computer vision, natural language understanding, etc.). Other projects could explore include developing new AI capabilities for mobile devices, training teachers and mentors to support students as they learn about AI, and developing AI-based mentoring agents to help scale this knowledge and training.

Class Website: <http://piazza.com/mit/spring2020/mass656s898/home>

Class Mailing List: Fill out this form and we'll add you to the mailing list:

<https://forms.gle/y3YjvMYbK1BNFe23A>

Grading

40% design reviews and critiques
20% class attendance and participation
40% final project (no exam)

Major Assignment Deadlines

March 30 Written Project Proposal
April 1 Project Proposal Presentation
April 22 Project Proposal Update Presentation
May 6, 13 Final Project Presentations

Final Project

This course requires the completion of a class project. Projects can be individual or group projects.

Project Proposal / Final Presentations

We will have presentations for project proposals during class on March 11 and presentations of the final projects during the last two classes (May 6 and 13). Presentations should be a maximum of 20 minutes long, including Q&A. Prepare about 15 minutes' worth of content. You should present:

- Your Team: Each name and affiliation
- Learning objectives: What are the concepts, attitudes, and skills students should walk away with
- Big Ideas and 4 P's (Peers, Participation, Passion, Play): What big ideas in AI are you trying to communicate? How do the 4 P's come into play with your idea
- Activity and assessment design*. Give us an overview of what kinds of things students will do in your curriculum. (See notes from April 8 and April 15 lecture)
- [Final presentation only] Demo*. Walk us through your project
- Technical design* and activity guides.
- Conclusion. Wrap-up with any reflections, questions, or planned future work.

** Activity design, demo, and technical design may not apply to all projects and the order of these items may be different for projects. Present this part in the manner that makes sense for your project.*

Final Report

Your final report should be 5-15 pages long. Include the following sections:

- Team: Each person's skills and role
- Learning Objectives: AI/Ethics concepts and practices you want kids to learn, Big Ideas this activity supports
- Activity Design : How will kids learn these objectives in an active, project based way? Rationale for how it supports learning the AI concept (4 Ps: Peers, Participation, Passion, Play, plugged/unplugged activity design, etc.)
- Workshop Format: How will you introduce the activity? What format: how long, structure of activities, time allocation, etc. motivate how format supports learning)
- Working prototype : What did you build? What tools did you use? How does it work?
- Teacher/Student Guides: What support materials do you?

- Assessment Design. How are you going to measure what students learned? How successful is your module?

Group Sign-Up

As you solidify your ideas about the group project, share them with your classmates on this [Google spreadsheet](#).

COUHES Training

In order to complete the fieldwork component of this class, you will need to complete Human Subjects Training with the MIT Committee on the Use of Humans as Experimental Subjects (COUHES). If you have human subjects training from another school, that could be used. Please let us know so that we can confirm your certification.

1. Log into the CITI site: <https://www.citiprogram.org/members/index.cfm?pageID=50>
2. You will need a valid MIT certificate for authentication, available via IS&T. For non MIT personnel: Please register for an account on the University of Miami CITI site. When registering for the course, select 'Massachusetts Institute of Technology Affiliates' as your institution.
3. Take this course: Social & Behavioral Research Investigators.
4. Send your certificate to dipaola@media.mit.edu

CORI Authorization

In order to authorize you for fieldwork in Boston Public schools, you need to complete a form to initiate a background check.

1. It's a short [online form](#), but you will need to have a Driver's License or Passport handy.
2. Volunteer location is: BPS Murphy Elementary
3. Give TA Randi a heads up when you've submitted the form. (Do not e-mail the completed form or your ID to anyone.)

Draft syllabus/meeting schedule (lectures may move, but no additional assignments will be added)

Feb 5 Class goals, organization and grading.

Homework (due Feb. 11) Read: [Envisioning AI for K-12: What Should Every Child Know About AI?](#), [AI for K12 Working Group: Draft of Student Outcomes in AI](#), and [Democratizing Computing with App Inventor](#).

Respond: What do you think kids should learn about AI and what Big Idea are you most interested in creating projects around? Post a ~250-word response on Piazza.

Feb 11 Prior work: App Inventor, Scratch, and PreK-12 AI
 Guest Lecture: Jessica Van Brummelen, App Inventor & Alexa

- Feb 11 (cntd) Homework (due Feb. 19) Read: Here are the CS Standards developed by the CSTA and the developing AI standards developed by the AI4K12 group. Review these standards and use them to think about the projects you create. How do the CS and AI standards mesh with one another? Where do they seem to be in tension? [CS Standards Chart](#), [CS Standards Full](#), [AI4K12 Learning Outcomes - Draft in progress!](#)
- Review: Look at the [PIC curriculum](#) and write a review. First, summarize the curriculum - what are students doing and what are the goals of the activities. What things seem most exciting? What do you have questions about or not understand? What is one thing you would add or take away from the activity. Post a ~250-word response to this note on Piazza.
- Come up with an App Inventor AI project and add it to the [project idea list](#).
- Feb 19 Scratch and K12 AI
Guest Lecture: Andrew Sliwinski, Scratch Foundation
Guest Lecture: Katherine Gallagher: K-12 AI and The MIT Quest for Intelligence
- Homework (due Feb. 25) Watch: Watch this video about design-based research to prepare for next week's speaker, Eric Klopfer >
<http://isls-naples.psy.lmu.de/video-resources/guided-tour/15-minutes-penuel/index.html>
- Read: Read one of the following 3 papers, and ideate on fun ways they could explain these to middle schoolers. Ideas can be along the lines of content, medium or interaction. You don't have to develop anything, but just some ideas about what part of the models or its application and what method of instruction would they use to make middle school students familiar with the concepts they read about. You can make it about the whole paper, or a part of it. [CycleGAN](#), [DeepFakes](#), [Style Transfer](#).
- Final Projects and Fieldwork. Check out all of the cool activity ideas. There's a list of [general ideas](#) and a list of [AppInventor specific ideas](#). I'd encourage you to write down ideas that interest you, but you don't necessarily have to feel committed to anything. Next class we will be discussing the ideas and forming teams!
Signup for your TWO fieldwork sessions.
- Feb 26 What might an K-12 AI curriculum look like?
Guest Lecture: Eric Klopfer, Open Learning
- Homework (due Mar. 4) Propose: Over the course of the past few weeks, you've generated a *lot* of project ideas. Use this week to connect with your classmates about their ideas. Take one of the ideas and write a draft of an abstract. Next week we will work on forming teams. Project proposal abstracts from teams will be due March 11 and a final proposal will be due March 18. Where to find the ideas: [General ideas](#), [AppInventor specific ideas](#), ideas discussed at the beginning of Feb. 26 class.

Fed 26 (cntd) Read: Check out the [AI + Ethics curriculum](#) that we will focus on in class next week with guest speaker Blakeley Payne.

Fieldwork: If you're taking the class for credit, or want experience in the field, did you [signup](#) for fieldwork sessions?

March 4 Ethical AI Design Practices
Guest Lecture: Blakeley Hoffman and Abby Everett Jaques - *AI & Ethics*
Team brainstorm: Design of hands-on projects to learn AI concepts & practices

Mar 11 ~~Students present project plans for final project~~
Guest lecturer: Eric Rosenbaum, Scratch Foundation - *Scratch Extensions*
Adjusting to COVID changes:

Mar 18 ~~Design Critique: existing examples (Cozmo, PopBots, etc)~~
~~Finalize COUHES submissions~~
===== Class canceled =====

Mar 25 ===== No class (spring break) =====

April 1 Project Teams - Project Proposal Presentations
Project Proposals Due

April 8 Glenda Stump: Research Evaluation, ~~Snap! Design Critique~~
Project Teams - Wireframes and prototypes
Virtual class notes: [The Art of Evaluation with Glenda Stump](#)

April 15 YJ Kim: Assessment Design, ~~Zhorai Design Critique~~
Project Teams - Assessment Design Critique
Virtual class notes: [Assessment with YJ Kim](#)

April 22 Project Teams- In-Depth Project Updates
Virtual class notes: [Project Feedback](#)

April 29 ML for Kids Design Critique
Project Teams - Updates

May 6 Final Project Presentations

May 13 Final Project Presentations
Project Write-Ups due